Note on Intra-uterine Eggs of Heterodontus (Cestracion) Phillipi.

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With 2 Text-figures.

1. The Segmentation.

In 1901 Bashford Dean published in the 'Annotationes Zoologicæ Japonenses' a paper, entitled "Reminiscence of Holoblastic Cleavage in the Egg of the Shark, Heterodontus (Cestracion) japonicus Macleay," in which he described on the surface of the egg of that fish a system of lines (furrows) supposed by him to be indications or "reminiscences" of complete segmentation. In a postscript, he adds:

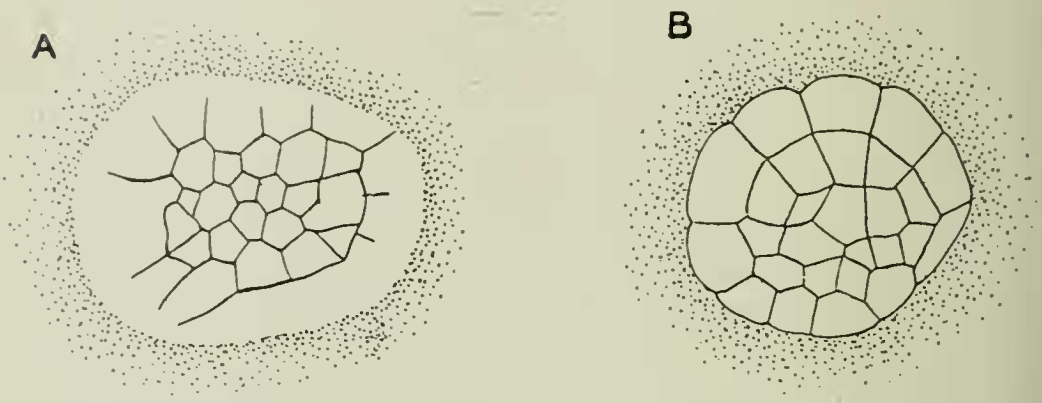
"I have recently taken several eggs (early blastula) from the oviduct of Cestracion, and there can now be little doubt that the lines represent cleavages. In one specimen the entire germ disc was successfully removed and viewed as a transparent object, and one could then detect cellular outlines bridging the space between the germ disc and the yolk furrows." I had previously published[1] an account of the early development of the common Australian species (H. phillipi) of the same genus. In none of the eggs then examined had I seen any indication of such lines. But all

[1] "On the Development of Heterodontus (Cestracion) Phillipi," Part 1, 'Proc. Linn. Soc., New South Wales,' vol. xxii, pp. 96–103, pls. iv, v (1898).

these were eggs which had already been laid, and the earliest stage represented was that of a blastoderm in which an ectodermal layer had already become differentiated from the underlying irregular mass of lower-laying cells.

Recently I have obtained successful preparations of several uterine eggs of Heterodontus Phillipi. Two of these show very similar stages of late segmentation, one a little further advanced than the other. In both the lines of cleavage are entirely confined to the area of the orange spot, and do not show any trace of a tendency to become extended

TEXT-FIG. 1.



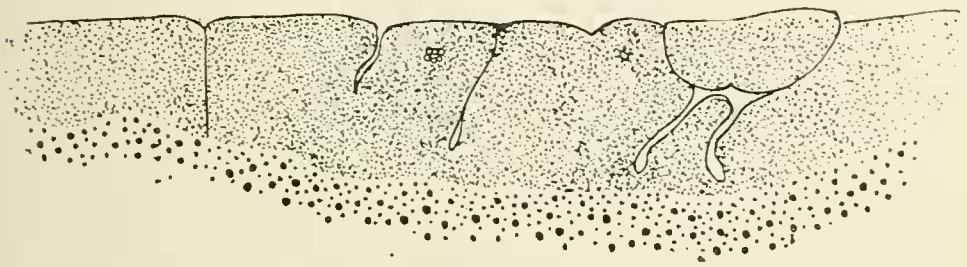
Surface views of two blastoderms of Cestracion Phillipi.

beyond its limits. In the less advanced stage (Text-fig. 1) (A) the peripheral part of the blastoderm has not yet become completely divided. In the other (B) the division is complete, the blastoderm is of sub-elliptical outline, and presents the appearance on a surface view of an irregular ring of larger cells separated from one another by fissures having a radial arrangement and surrounding an area of smaller cells of great irregularity in size and shape.

Two other eggs, taken from the uteri some weeks later, show much more advanced stages. In one the blastoderm, without having greatly increased in diameter, has grown very considerably in thickness. Beneath it, about its posterior limit, there is a narrow space bounded below by the fine-grained yolk—the early beginnings of the segmentation

cavity. This is a stage not far removed from one which is represented in Fig. 1 of my 1898 paper. The other is still further advanced. The segmentation cavity has become a large space below the posterior end of the blastoderm, with a thin roof through which the cavity shows itself as a dark area in the living egg. This is an earlier blastoderm than the one represented in Fig. 3 of the paper referred to, but shows essentially the same condition.

Text-fig. 2.



Vertical section of the blastoderm of Cestracion Phillipi represented in Text-fig. 1, A.

2. The "Orange Spot."

Throughout the stages of segmentation and blastoderm formation a peculiar granular material is traceable which is not affected by the staining agents that colour the yolk granules and the protoplasm. In the earliest phases of segmentation it is very abundant and conspicuous, occurring in small irregularly scattered masses below the level to which the earlier segmentation fissures descend. The granules vary in shape and size, but are always smaller than the smallest granules of the parablast. In sections strongly stained with hæmatoxylin they appear bright and yellowish in colour. In later stages they all become enclosed in the cells of the blastoderm, and in some series they show a tendency to become massed together in the lower part of the cell, an arrangement which may be explicable on the view that the granules consist of a relatively heavy substance, which, originally diffused throughout the cell, becomes precipitated

when the blastoderm is fixed. However this may be, it appears to be almost certain that we have here the pigment to which the red colour of the early stages is due. The constant occurrence of this red colouring matter (producing the familiar "orange spot") in all families of Elasmobranchs would appear to indicate for it considerable functional importance, and I venture to suggest that it may play the part of a respiratory pigment aiding in the oxidation of the massive blastoderm and the underlying parablast.